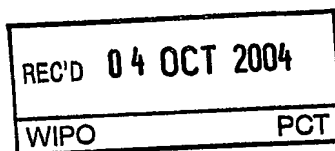




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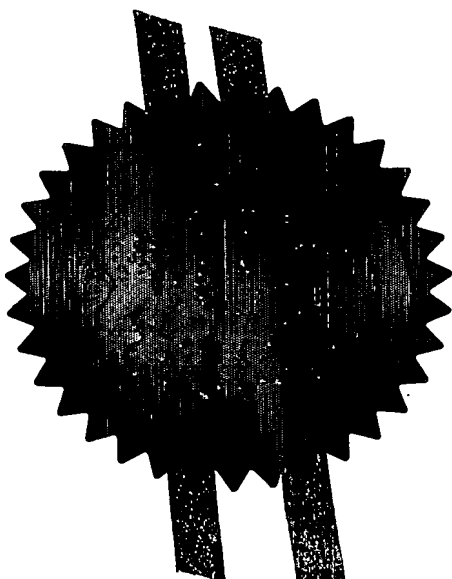
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24JUL03 E824992-1 001463
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1. Your reference 200308882-1 GB

2. Patent application number
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24 JUL 2003

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Hewlett-Packard Development Company, L.P.
20555 S.H. 249
Houston, TX 77070
USA

Patents ADP number (if you know it)

8557886001

If the applicant is a corporate body, give the country/state of its incorporation

N/A AS A L.P.

4. Title of the invention

Print Having Attached Data Storage, Storage Medium Therefore and Method of Providing Same

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Richard A. Lawrence
Hewlett-Packard Ltd, IP Section
Filton Road, Stoke Gifford
Bristol BS34 8QZ

Patents ADP number (if you know it)

7448038001

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Country

Priority application number
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Date of filing
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Number of earlier application

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Yes

- a) any applicant named in part 3 is not an inventor, or
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Fee Sheet

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Signature
Richard A. Lawrence

Date 23/7/03

12. Name and daytime telephone number of person to contact in the United Kingdom

Meg Joyce Tel: 0117-312-9068

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Title: Print having Attached Data Storage, Storage Medium therefore and Method of Providing Same

5

Field of the Invention

The invention relates to a print of a plurality of images having attached data storage in the form of a memory tag associated with each image. It also relates to the provision of a print storage medium for such prints, and a method of storing data relating to a plurality of images. The invention is primarily intended for use with photographic images but is not limited to such use.

Background of the Invention

Prior to the advent of digital photography most photographic images were stored as negatives and/or as image prints. To assist in maintaining a library of images index prints, comprising a small print of each photograph from a film on a single sheet, were often produced. With the advent of digital photography, and the ability to scan photographs and store them electronically even if taken using traditional methods, the storage options have increased dramatically.

In many cases whole libraries of photographs are simply stored on the hard discs of computers, whilst in other cases they are stored on removable storage media, such as floppy discs or CDs. However, this often means a very large number of the removable storage media, particularly when floppy discs are used and, when a user wishes to locate a particular image and print a copy of it, finding it can be problem. If there is a collection of index prints relating to the library which provides the location of the stored image file then at least it is simply a question of going to the correct location and printing the image. However, in many cases image prints have not been made and the user has to

look through the stored images (most conveniently using appropriate software to run a slide show of them) to identify which one is required.

More recently other alternatives have been suggested, some examples of which are discussed below.

5 In the Applicant's European Patent Application published under No. EP 1 158 766 there is described a method and apparatus for selection of pictures to print from a digital film. In this method a selection sheet is printed including thumbnail representations of the pictures and associated with each one a plurality of selection fields. The relevant selection fields are marked and
10 the selection sheet fed back into the printer which scans the sheet and in accordance with the marked selection fields prints one or more pictures.

 In the Applicant's US Patent No. US 6,535,298 B2 methods for storing and retrieving digital image files to and from an archival storage system such as a file server or a mass storage medium, using a user completed proof
15 sheet/order form are described. The proof sheet is printed containing a number of thumbnail images and corresponding image selection user designation areas, along with a storage selection user designation area, markable by the user to indicate which images are to be stored or retrieved. The form is then scanned and the marked areas detected and acted upon.

20 In the Applicant's US patent Application published under No. US 2001/0019416 A1, which is a continuation in part of the above discussed patent, the proof sheet/order form is used to designate more than the storage and/or retrieval of images. It is described in use for selection of images to be printed, faxed or e-mailed.

25 It is an object of the present invention to provide a further alternative way to store and select images, such as photographic images, including a new print storage medium which alleviates the above identified problems.

Summary of the Invention

According to a first aspect of the invention there is provided a print having a substrate and a plurality of memory tags coupled to the substrate, wherein the print is an index print including a plurality of images and a memory tag is associated with at least some of the images for storage of data relating to that image.

Memory tags in the form of Radio Frequency Identification (RFID) tags are well known in the prior art. RFID tags come in many forms but all comprise an integrated circuit including a memory, in which information can be stored, and a coil which enables the circuit to be interrogated by a reader which also powers it by means of an inductive (wireless) link. Many uses of memory tags are already known, some of which relate to storage of data relating to images.

For example Eastman Kodak Company has proposed a range of applications relating to images, presumably intended for use with photographic images. In EP 1 076 316 A2 a single image print has a memory tag coupled to it which stores data concerning the print. The data is described as being to do with the manner in which the image was processed and printed, and the file name under which the full image data is stored in another location (such as in a computer or other higher capacity storage medium). In US 6,363,239 B1 a single image print is described having a memory tag coupled thereto which stores audio data relating to the print. In both of these patent documents it is suggested that, if a single memory tag is not adequate for storage of the data relating to the single image concerned, then multiple memory tags may be used, specifically in a stack at the same location on the print substrate.

The invention provides assistance in making practical use of the developments in RFID technology, and indeed in any other memory tag technologies, in relation to storage of data relating to images.

For each image in respect of which data is stored, the image may be printed with low resolution and the data relating to the image may include the image in high resolution.

For each image in respect of which data is stored, the data relating to the
5 image may include information about the initial creation of the image and/or about the content of the image.

For each image in respect of which data is stored, the memory tag associated with the image is preferably located on the substrate adjacent to the respective image.

10 Conveniently the substrate is divided into a plurality of image areas each of which has printed thereon a single image and is provided with an associated memory tag. Each memory tag may be located in the same place in the respective image area or may be located in the same place with respect to the respective image.

15 The print may further include a further memory tag for storage of data relating to all of the images on the print.

Preferably the print includes an icon at the location of each memory tag.

According to a second aspect of the invention there is provided a print storage medium, for a print in accordance with the first aspect of the invention,
20 the print storage medium including a substrate and a plurality of memory tags coupled thereto at locations spaced apart over the area of the substrate.

The substrate is preferably divided into a plurality of image areas and a memory tag may be located in each image area.

The image areas may form a regular grid with each memory tag located
25 in the same place with respect to the image area in which it is located. Alternatively the image areas may form a regular grid with the memory tags located in different locations within the image areas.

According to a third aspect of the invention there is provided a method of storing data concerning a plurality of images, on a print storage medium

including a substrate and a plurality of memory tags coupled thereto at locations spaced apart over the area of the substrate, the method comprising the steps of:

printing a plurality of visible images onto the substrate, each one adjacent to a memory tag;

- 5 for at least some images storing data associated with the respective image in the memory tag adjacent to it.

According to a fourth aspect of the invention there is provided a method of storing data concerning a plurality of images comprising the steps of:

- printing a plurality of visible images onto a substrate;
10 applying a memory tag to the substrate adjacent to each image, and
for each image adjacent to which a memory tag has been applied, storing data associated with the image in the memory tag adjacent to it.

- The memory tags may be applied to the substrate before the data is stored in them or the data may be stored in the memory tags before they are
15 applied to the substrate.

Brief Description of the Drawings

Examples of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

- 20 Figure 1 schematically illustrates a first embodiment of a print according to the invention;

Figure 2 schematically illustrates a memory tag, as used in the invention, and read/write device;

- Figure 3 schematically illustrates a printer and tag reader/writer as may
25 be used to create a print according to the invention, and

Figure 4 schematically illustrates a second embodiment of a print according to the invention.

Detailed Description of the Preferred Embodiments

Referring to Figure 1, a print 10 comprising a plurality of images I on a substrate 12 is schematically illustrated. The area of the substrate 12 is nominally divided up into images areas A and a border B as illustrated by the chain lines. Each image area A can have an image I printed in it, and in this case areas A_1 to A_{11} have images I_1 to I_{11} respectively and areas A_{12} to A_{15} do not have images printed in them and are left blank. The images I are not of a particular size or relative dimensions, but rather vary as desired; they could however all be of the same size. Each area A has located within it, and coupled to the substrate 12, in this case top right of each area A, a memory Tag T. The memory tags T thus form a regular array on the substrate 12.

The print 10 is intended as an index print of the images I. The images I are printed onto the substrate 12 in low resolution and data relating to each image I is stored in the corresponding memory tag T. The data preferably includes the image in high resolution format, and may further include data concerning the image such as the camera settings, light levels etc. from when it was formed and information such as where it was taken, what it is of and so on, although any data chosen may be stored in the memory tags T.

The substrate 12 and memory tags T combined form a print storage medium 14, i.e. a physical storage medium specifically adapted for the storage of data relating to a plurality of images both in visible printed form and in digital form.

It is also possible of course that some, or indeed all, of the images may be printed onto the substrate 12 without data being written to the associated memory tag T. For example it may be, with regard to Figure 1, that I_{10} is simply printed into area A_{10} of the substrate 12 with no data having been stored in the associated memory tag T_{10} .

In order to explain the invention, and how it may be used in practice, more fully the operation of memory tags T and an associated read/write device

20 will now be described briefly with reference to Figure 2. A memory tag T includes an antenna coil L1 and a capacitor C1 connected in parallel therewith to form a resonant circuit. It further includes a memory M and processing and power circuit P1. The read/write device 20 includes an antenna coil L2 and a capacitor C2 in parallel therewith to form a resonant circuit, and a processing and signal generating circuit P2.

A signal generator within P2 generates a signal at the chosen frequency of operation, such as 2.45GHz, and this is applied to the antenna coil L2 and thus generates an electro-magnetic field which, provided the memory tag T is sufficiently close to the read/write device 20, penetrates the antenna coil L1 of the memory tag T. By induction a voltage is thus generated in the antenna coil L1, this is rectified in circuit P1 and used to power the memory tag T. The capacitance of the capacitors C1 and C2 is selected such that the resonant circuits are both resonant at the frequency generated by the signal generator, in order to maximise transmitted signal strength and received signal.

When data is to be written to the memory tag T by the read/write device 20 the radio frequency signal generated in P2 is modulated, e.g. amplitude modulated, with the data before being applied to the antenna coil L2 and transmitted. The signal received by the memory tag T by inductive coupling thus both powers the memory tag T and communicates with it, the circuit P1 separating the data signal from the carrier and passing data for storage to the memory M.

Similarly, if data is to be read from the memory tag T the circuit P1 applies a signal indicative of the data to the antenna coil L1 which is detected, as a result of the inductive coupling, by antenna coil L2 and deciphered in circuit P2 before being passed from the read/write device 20 to a main processor or alternative storage device (not shown). This signal may for example be transmitted using load modulation. In RFID systems such as this the power consumed by the memory tag T can be measured as a drop in voltage

across the internal resistance of the antenna coil L2 of the read/write device 20. A load resistance within the circuit P1 may be switched on and off, thus altering the power consumed by the memory tag T which is then detected as an amplitude modulation of the voltage across the antenna coil L2 of the read/write device 20.

For more detail concerning the operation of RFID tags the reader is referred to the RFID Handbook, Klaus Finkenzeller, 1999, John Wiley & Sons.

Thus it will be understood that communication with the memory tags T is via a read/write device 20. Read/write devices 20 can take many forms but may be hand held pen type devices which are connected to a computer, or may be incorporated into other equipment such as a printer. Examples are discussed below.

A printer which is also provided with a memory tag read/write device 20, and can read or write to memory tags T previously attached to or embedded in paper passed through it, is described in the Applicant's pending UK Patent Application No. 0227201.1 filed 21 November 2002. The printer will not be described in detail here, but is described very briefly with reference to Figure 3.

A printer 30 comprises a main processor 32, a print head 34, a read/write device 20 and a mechanics controller 36, which controls the movement of the print head 34 and read/write device 20 and other components such as paper feed rollers (not shown). The printer 30 is connected to a computer 38. The printer 30 receives print instructions from the computer 38 and the main processor 32 then issues instructions as necessary to the print head 34, the read/write device 20 and the mechanics controller 36 to implement the instructions from the computer 38. With such a printer 30 a print 10 may be produced very simply as follows.

Print storage medium 14 is fed into the printer 30 and instructions are issued by the computer 38 to print low resolution images I_1 to I_{11} in image areas A_1 to A_{11} of the substrate 12, and to write high resolution image data for images

I_1 to I_{11} to memory tags T_1 to T_{11} . The printer 30 may be set up for a particular form of print storage medium 14, and thus know the locations of the memory tags T , or it may need to detect the locations of the memory tags T either before commencing printing or as it proceeds. The main processor 32 of the printer 30
 5 then moves the print storage medium 14 through the printer 30, moves the print head 32 and read/write device 20 as necessary and instructs the print head 32 to print and the read/write device 20 to write as appropriate to achieve the desired aim.

Referring now to Figure 4 an alternative form of print 40 is illustrated
 10 schematically. Similarly to the print 10 it comprises a plurality of images I on a substrate 42 which is nominally divided up into image areas A and a border B as illustrated by chain lines. Each area A can have an image I printed in it, and in this case areas A_1 to A_4 , A_6 to A_8 , A_{10} to A_{12} , and A_{14} to A_{16} have images I_1 to I_4 , I_6 to I_8 , I_{10} to I_{12} , and I_{14} to I_{16} , respectively and areas A_5 , A_9 , and
 15 A_{13} , do not have images and are left blank. The areas that contain images also each have within them a memory tag T . However these are not all located in the same place with respect to the area A in which they are located but rather with respect to the image I with which they are associated. That is they are all located bottom right of the respective image I , and thus their location within the
 20 area A depends on the orientation of the image I concerned, depending on whether the image I is in portrait or landscape format.

In this embodiment those areas without an image do not contain a memory tag T . However, it should be understood that images may be printed into areas A without a memory tag T being applied to that to the respective
 25 area, if it not required to store any data relating to the image concerned.

The substrate 42 and memory tags T combined from a print storage medium 44, as described above in respective of print storage medium 14.

A printer which is also provided with a memory tag read/write device 20, and can read or write to memory tags T previously attached to or embedded

in paper passed through it, and can also place memory tags onto paper passed through it, is described in the Applicant's pending UK Patent Application No. 0227199.7 filed 21 November 2002. The printer operates in a very similar way to that described above with reference to Figure 3 but with the additional
5 feature that it can also write to memory tags and then place them on the paper, or place them on the paper and then write to them.

Such a printer and memory tag placer is suitable for production of a print
40 in which the location of the memory tags T is dependent upon the orientation of the image I with which it is associated. That is a plain sheet of paper would be fed into the printer and, during its passage through the printer,
10 would have printed onto it the various images, as well as having applied to it at appropriate locations memory tags T with the relevant data written to them.

A further modification to prints according to the invention is the provision of a memory tag T_B located within the border of the substrate, as
15 shown in Figure 4. This memory tag T_B would conveniently have stored in it data concerning the index print 40 as a whole, such as a list of the images I on the index print 40, and their respective locations on the print 40, including the locations of the memory tags T if appropriate.

Conveniently for all embodiments of prints according to the invention
20 visible icons are printed at the location of each memory tag T such that users of the prints can readily locate the memory tags T when seeking to read the data from them. This will be particularly beneficial where the user is using a hand held reader rather than data being read by passing the print through a larger piece of equipment which in general would be able to scan for and thus detect
25 the memory tags T before reading the data as required.

Clearly, other forms of print according to the invention may be formed with variations in the relative positions of the printed images I and the memory tags T, and with variations in the form of data stored in the memory tags T.

CLAIMS

1. A print having a substrate and a plurality of memory tags coupled to the
5 substrate, wherein the print is an index print including a plurality of images and
a memory tag is associated with at least some of the images for storage of data
relating to the respective images.
2. A print according to claim 1 wherein for each image in respect of which
10 data is stored on an associated memory tag, the image is printed with low
resolution and the data relating to the image includes the image in high
resolution.
3. A print according to claim 1 or 2 wherein for each image in respect of
15 which data is stored on an associated memory tag, the data relating to the image
includes information about the initial creation of the image.
4. A print according to claim 1, 2 or 3 wherein for each image in respect of
20 which data is stored on an associated memory tag, the data relating to the image
includes information about the content of the image.
5. A print according to anyone of the preceding claims wherein for each
image in respect of which data is stored on an associated memory tag, the
memory tag associated with the image is located on the substrate adjacent to the
25 respective image.
6. A print according to anyone of the preceding claims wherein the
substrate is divided into a plurality of image areas each of which has printed
thereon a single image and is provided with an associated memory tag.

7. A print according to claim 6 wherein each memory tag is located in the same place in the respective image area.
- 5 8. A print according to claim 6 wherein each memory tag is located in the same place with respect to the respective image.
9. A print according to any one of the preceding claims wherein it includes a further memory tag for storage of data relating to all of the images on the
- 10 print.
10. A print according to any one of the preceding claims wherein it includes an icon at the location of each memory tag.
- 15 11. A print storage medium, for a print in accordance with anyone of the preceding claims, the print storage medium including a substrate and a plurality of memory tags coupled thereto at locations spaced apart over the area of the substrate.
- 20 12. A print storage medium according to claim 11 wherein the substrate is divided into a plurality of image areas and a memory tag is located in each image area.
13. A print storage medium according to claim 12 wherein the image areas
- 25 form a regular grid and each memory tag is located in the same place with respect to the image area in which it is located.

14. A print storage medium according to claim 12 wherein the image areas form a regular grid and the memory tags are located in different locations within the image areas.

5 15. A method of storing data concerning a plurality of images, on a print storage medium including a substrate and a plurality of memory tags coupled thereto at locations spaced apart over the area of the substrate, the method comprising the steps of:

printing a plurality of visible images onto the substrate, each one
10 adjacent to a memory tag;

for at least some of the images storing data associated with the respective image in the memory tag adjacent to it.

16. A method of storing data concerning a plurality of images comprising
15 the steps of:

printing a plurality of visible images onto a substrate;

applying a memory tag to the substrate adjacent to at least some of the
images, and

for each image to adjacent to which a memory tag has been applied,
20 storing data associated with the image in the memory tag adjacent to it.

17. A method according to claim 16 wherein the memory tags are applied to the substrate before the data is stored in them.

25 18. A method according to claim 16 wherein the data is stored in the memory tags before they are applied to the substrate.

19. A print having a substrate and a plurality of memory tags coupled to the substrate substantially as hereinbefore described with reference to Figures 1 and 4 of the accompanying drawings.

5 20. A print storage medium substantially as hereinbefore described with reference to Figures 1 and 4 of the accompanying drawings.

21. A method of storing data concerning a plurality of images substantially as hereinbefore described with reference the accompanying drawings

ABSTRACT

Title: Print having Attached Data Storage, Storage Medium therefore and Method of Providing Same

5

A print having a substrate and a plurality of memory tags coupled to the substrate, wherein the print is an index print including a plurality of images and a memory tag is associated with each image for storage of data relating to that image.

10

A print storage medium, for a print, the print storage medium including a substrate and a plurality of memory tags coupled thereto at locations spaced apart over the area of the substrate.

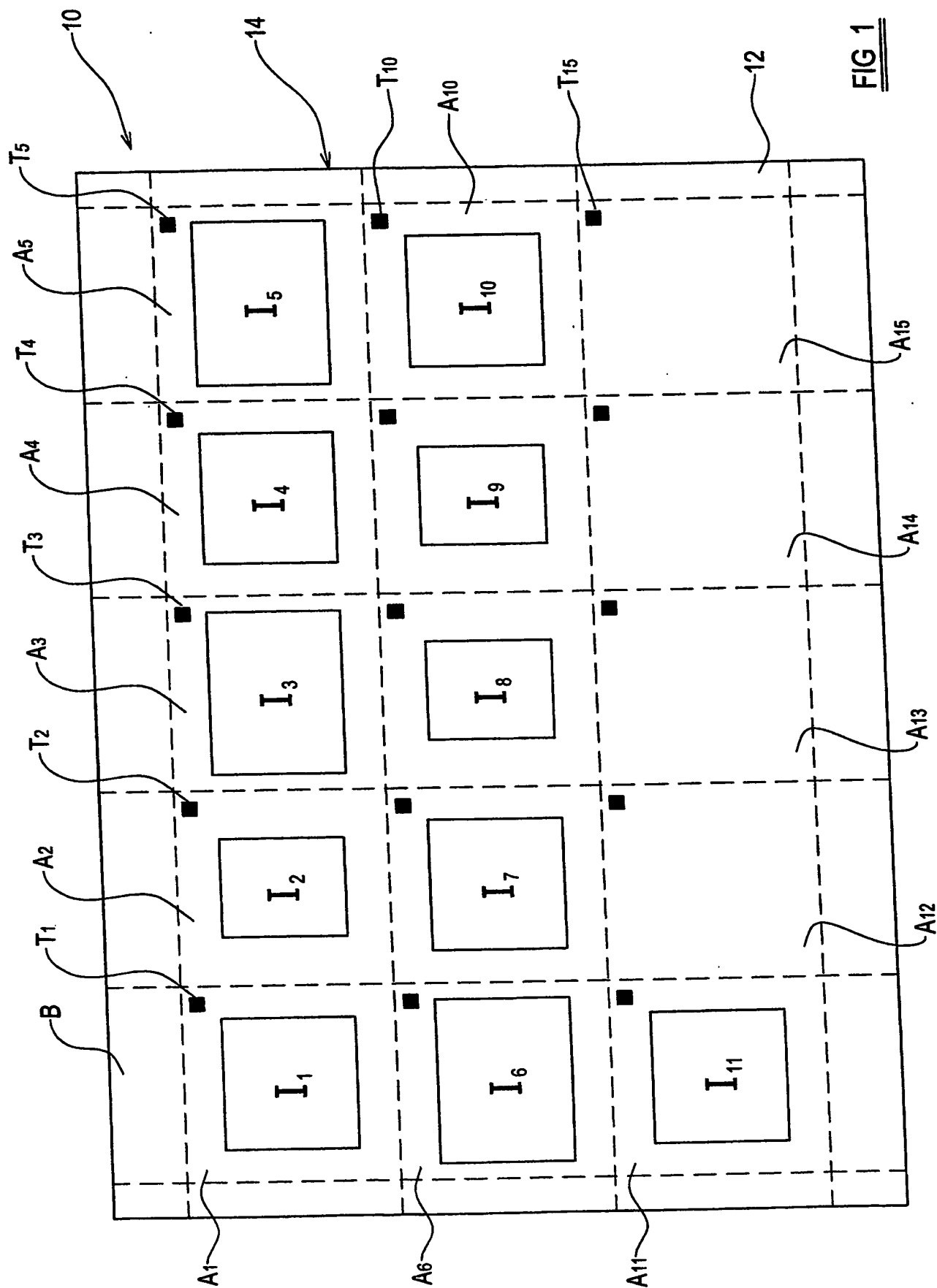
15

A method of storing data concerning a plurality of images, on a print storage medium including a substrate and a plurality of memory tags coupled thereto at locations spaced apart over the area of the substrate, the method comprising the steps of:

printing a plurality of visible images onto the substrate, each one adjacent to a memory tag;

20

for each image storing data associated with it in the memory tag adjacent to it.



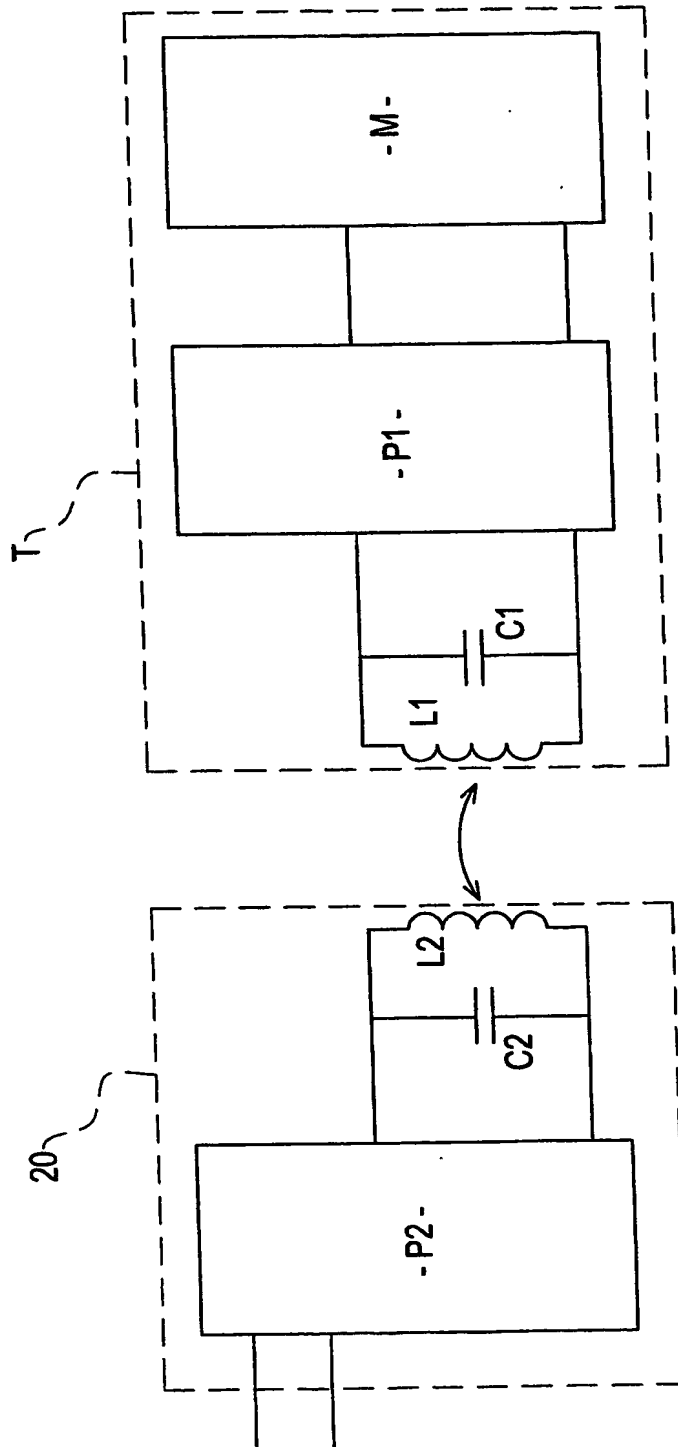


FIG 2

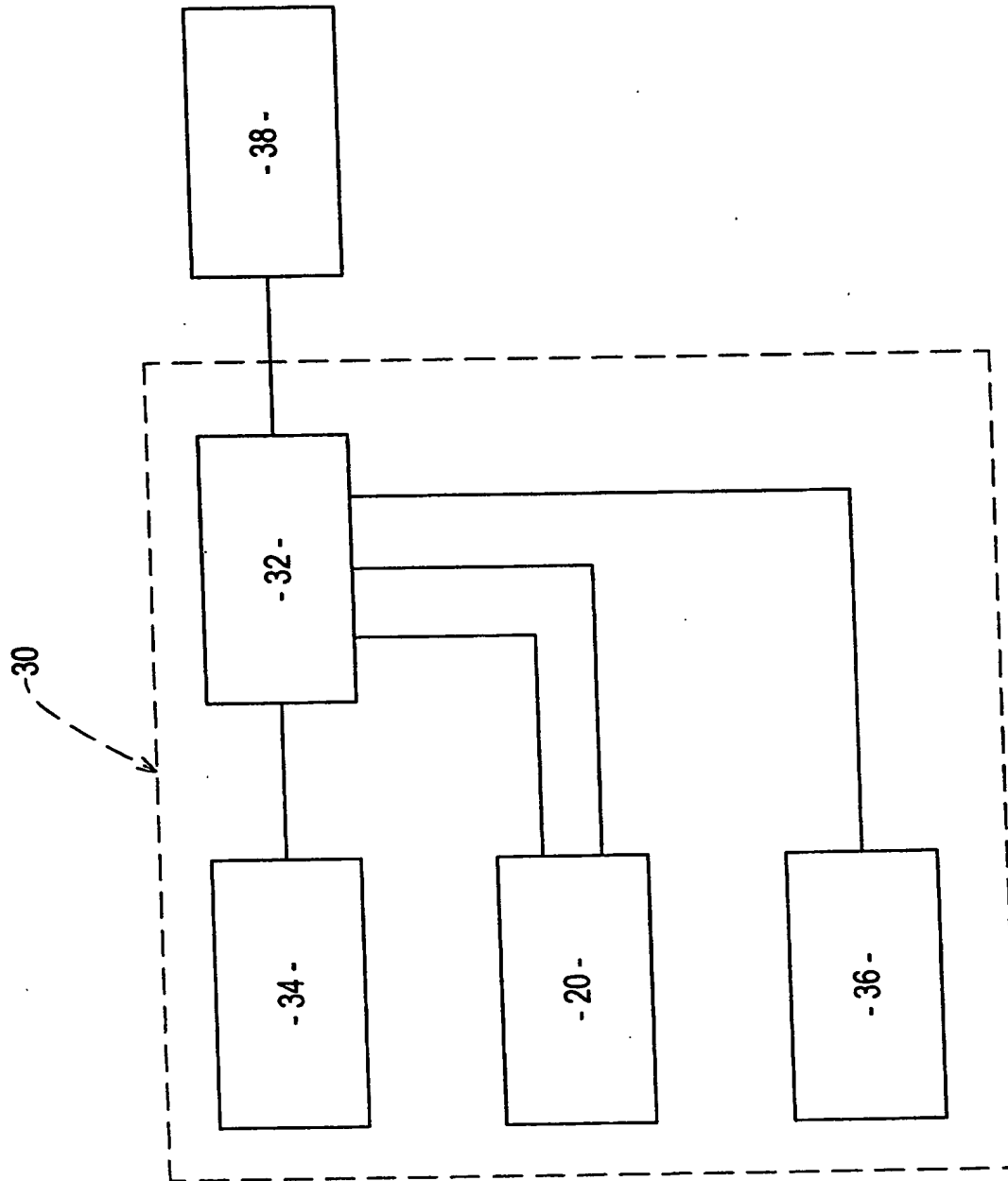


FIG 3

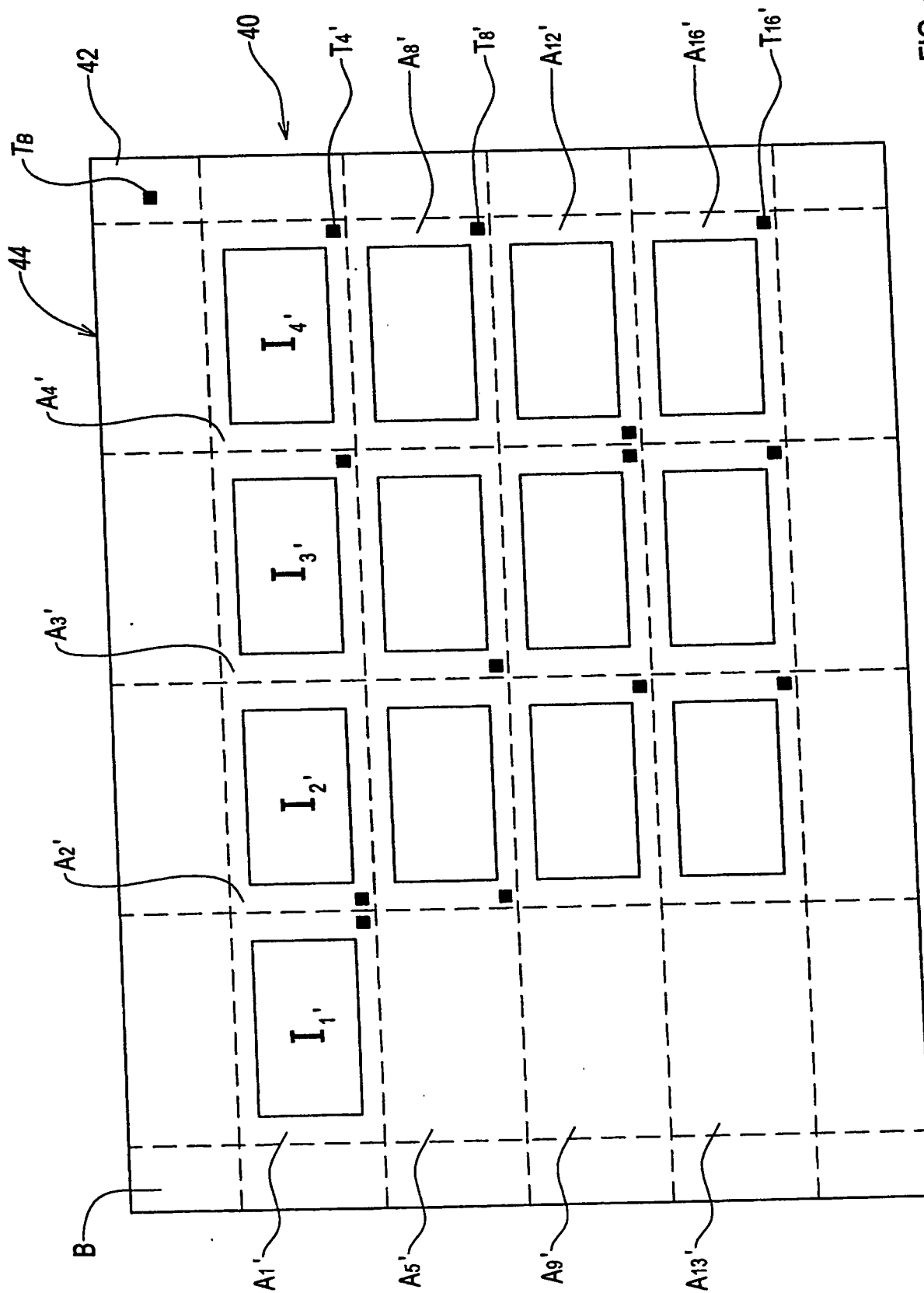


FIG 4

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